Scanning Electron Microscopic study of Piper betle L. leaves extract effect against Streptococcus mutans ATCC 25175

Type: Article

Abstract:

Introduction: Previous studies have shown that Piper betle L. leaves extract inhibits the adherence of Streptococcus mutans to glass surface, suggesting its potential role in controlling dental plaque development. Objectives: In this study, the effect of the Piper betle L. extract towards S. mutans (with/without sucrose) using scanning electron microscopy (SEM) and on partially purified cell-associated glucosyltransferase activity were determined. Material and Methods: S. mutans were allowed to adhere to glass beads suspended in 6 different Brain Heart Infusion broths [without sucrose; with sucrose; without sucrose containing the extract (2 mg mL(-1) and 4 mg mL(-1)); with sucrose containing the extract (2 mg mL(-1) and 4 mg mL(-1))]. Positive control was 0.12% chlorhexidine. The glass beads were later processed for SEM viewing. Cell surface area and appearance and, cell population of S. mutans adhering to the glass beads were determined upon viewing using the SEM. The glucosyltransferase activity (with/without extract) was also determined. One-and two-way ANOVA were used accordingly. Results: It was found that sucrose increased adherence and cell surface area of S. mutans ($p < 0.001$). S. mutans adhering to 100 mu m(2) glass surfaces (with/without sucrose) exhibited reduced cell surface area, fluffy extracellular appearance and cell population in the presence of the Piper betle L. leaves extract. It was also found that the extract inhibited glucosyltransferase activity and its inhibition at 2.5 mg mL(-1) corresponded to that of 0.12% chlorhexidine. At 4 mg mL(-1) of the extract, the glucosyltransferase activity was undetectable and despite that, bacterial cells still demonstrated adherence capacity. Conclusion: The SEM analysis confirmed the inhibitory effects of the Piper betle L. leaves extract towards cell adherence, cell growth and extracellular polysaccharide formation of S. mutans visually. In bacterial cell adherence, other factors besides glucosyltransferase are involved.

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